

# Radiation Tolerant Temperature-Invariant Scintillation Modules, Phase I

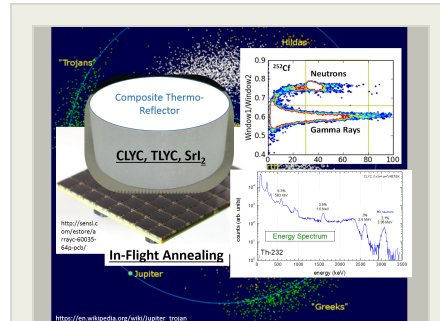
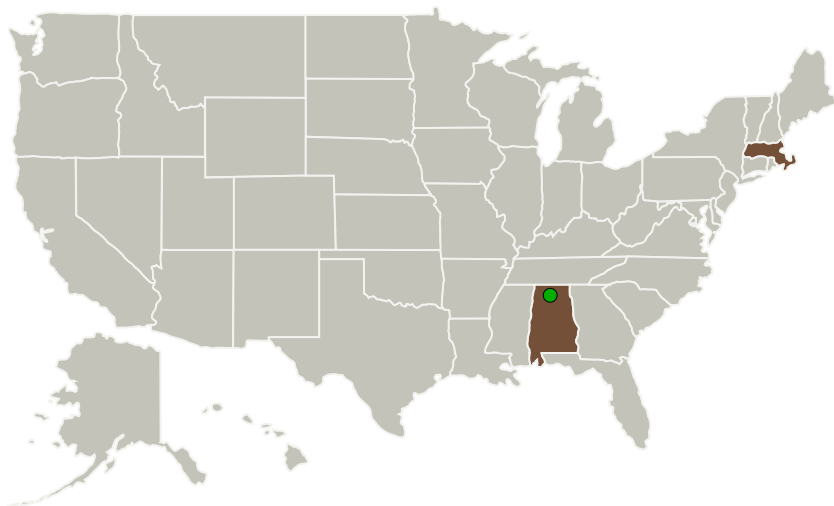
Completed Technology Project (2016 - 2016)



## Project Introduction

Radiation detectors are an invaluable tool for space applications that span planetary science, astrophysics, heliophysics, space weather, and dosimetry for human exploration, to name a few. A common technology used for radiation detection is scintillators, where the scintillation material generates a light flash with an intensity that is proportional to the energy deposited from the incident radiation. For exploration missions to hostile environments, such as those around Jupiter, Venus or Mercury, the dose to the scintillation material can become high, rendering them useless in a short time frame. A common practice to mitigate these effects is to anneal the scintillation materials, yet for the most advanced materials (hermetically packaged) that have unique properties that can be exploited (such as particle species discrimination based on the transient light response), there is no practical method or process to anneal them. For various experiments, the largest scintillation crystal possible may be ideal, yet when attempting to build an instrument inside a small spacecraft, such as a 3-6U cubesat, SiPMs are the only option to optically readout the crystal. Unless the energy spectrum can be compromised, a large crystal will require a large SiPM array, and to obtain the best performance from the detector, the array would need to be cooled. In both of these cases, the temperature of the scintillator and SiPM are modified for a specific purpose. The overall goal of this project is to develop a scintillator detector module for gamma ray and neutron detection that will provide mitigation strategies for reducing radiation and temperature effects.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Radiation Monitoring Devices, Inc.	Lead Organization	Industry	Watertown, Massachusetts
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Primary U.S. Work Locations

Alabama	Massachusetts
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## Project Transitions

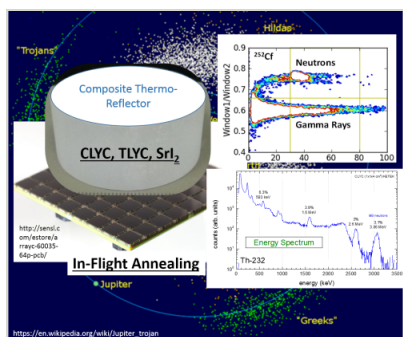
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139707>)

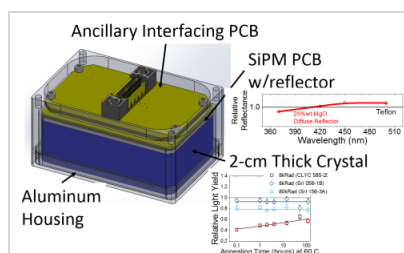
## Images



## Briefing Chart Image

Radiation Tolerant Temperature-Invariant Scintillation Modules, Phase I

(<https://techport.nasa.gov/image/130190>)



## Final Summary Chart Image

Radiation Tolerant Temperature-Invariant Scintillation Modules, Phase I Project Image  
(<https://techport.nasa.gov/image/135212>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Radiation Monitoring Devices, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

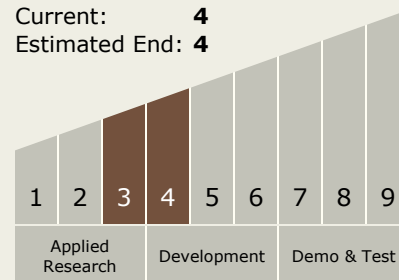
Erik B Johnson

## Technology Maturity (TRL)

Start: **3**

Current: **4**

Estimated End: **4**



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## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System